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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - OCTOBER 1981

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PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - OCTOBER 1981

STATUS OF PUBLICATIONS

Published

Eber, L.E. 1981. Large-scale sea-surface temperature anomalies in the northeast Pacific Ocean. CalCOFI Rep. 22: 19-33.

Slow-developing, long-lasting perturbations of sea-surface temperature in the eastern North Pacific are revealed by anomaly patterns representing monthly deviations from the mean seasonal cycle. These patterns are typically defined by a central core of anomalously warm (or cold) water located approximately between latitudes 30°-45°N, and west of longitude 140°W, which is partially surrounded by anomalously cold (or warm) water to the north, east, and south. They can persist up to several years and then, in a relatively short time, undergo a pattern reversal in which warm anomalies are replaced by cold anomalies and vice versa. Some examples are presented that represent selected periods in the 1960s and 1970s. A comparison of mean wind fields for January 1976 and January 1980, which were periods of sharply contrasting sea-temperature anomaly patterns, suggest that air-sea interaction processes have an active role in forming and maintaining these patterns.

Hewitt, Roger. 1981. Eddies and speciation in the California Current. CalCOFI Rep. 22: 96-98.

Northern anchovy, Pacific sardine, and Pacific hake have population discontinuities in the vicinity of Punta Eugenia, Baja California. The same latitude has been described as a provincial boundary for several taxa, including coastal fishes, brachyurans, bryozoans, and molluscs. The distribution of wind stress over the surface waters of the California Current region has a persistent

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feature in the same area: the coastal impingement of a zone of surface water convergence, which elsewhere is parallel to the coast of the Californias and several hundred kilometers offshore. Semipermanent cyclonic eddies are evident north and south of Punta Eugenia, and it has been suggested that they play a role in the recruitment of pelagic larvae to the adult populations in these areas.

Limited communication between the eddies suggests a speciation mechanism that would be most effective on populations that time their spawning to coincide with strong eddy formation. One may also expect geminate species north and south of Punta Eugenia and few short-range endemics with long dispersal strategies along the coast of northern Baja California between the eddies.

Kato, Susumu. 1981. Checking out shortbelly rockfish; Colintino Rose II's mission accomplished. Pacific Fishing, Nov. 1981, p. 96-100.

The commercial trawler, Colintino Rose II, was chartered by the Tiburon Laboratory of NMFS to catch shortbelly rockfish (Sebastes jordani). Over 70 tons were caught by the vessel in 14 tows averaging 40 minutes. The by-catch of other rockfish was less than 2%, except in one unusual case when 4,000 lb of widow rockfish were caught in one tow. The shortbelly rockfish were frozen and shipped to markets in Japan, Africa and the United States for trial sales.

Mallicoate, Donna L., and Richard H. Parrish. 1981. Seasonal growth patterns of California stocks of northern anchovy, Engraulis mordax, Pacific mackerel, Scomber japonicus, and jack mackerel, Trachurus symmetricus. CalCOFI Rep. 22: 69-81.

Market sample data obtained from the California Department of Fish and Game were analyzed to show number, mean length, and mean weight of fish by age and month for northern anchovy, Engraulis mordax, Pacific mackerel, Scomber japonicus, and jack mackerel, Trachurus symmetricus. In addition, maximum and minimum lengths and weights and their standard deviations were calculated.

Graphs showing the relationship between age and length and between age and weight were produced for each of these three species. The graphs show that the age-length relationships of Pacific mackerel, jack mackerel and northern anchovy landed in southern California and of northern anchovy landed in central California are adequately described by the von Bertalanffy growth curve. These graphs also show considerable seasonal variation in the age-weight relationships. These seasonal fluctuations may be related to the occurrence of spawning and feeding relationships. Analysis of the growth in weight suggests that a size limit would be expected to increase yields of Pacific mackerel, but not of jack mackerel or northern anchovy.

Moser, H. Geoffrey, and John L. Butler. 1981. Description of reared larvae and early juveniles of the calico rockfish, Sebastes dallii. CalCOFI Rep. 22: 88-95.

The developmental stages of calico rockfish, Sebastes dallii, are described marking the first time that a species of eastern Pacific Sebastes has been reared from birth to pelagic juvenile. Larvae were obtained from a field-caught pregnant female and reared on wild zooplankton screened to a size range of 105-272 µm. Calico rockfish larvae are 5 mm long at birth and transform into pelagic juveniles by 20-mm length. The larvae are slender compared to those of most other described species and have a distinctive pattern of melanophores. Morphological and meristic features are described, with particular attention to the development of head spines. Rearing techniques are outlined and discussed.

Stauffer, Gary D., and Susan J. Picquelle. 1981. Estimate of the spawning biomass of the northern anchovy central subpopulation for the 1980-81 fishing season. CalCOFI Rep. 22: 8-13.

The spawning biomass of the central subpopulation of northern anchovies off the Pacific coast of the State of California and Northern Baja California was surveyed by four ichthyoplankton cruises during the period, February-May 1980. The extent of the 1980 coverage was about half of the four cruise surveys conducted in previous years. Using a modified larva census method, the estimate of the 1980 spawning biomass was calculated at 1,775,000 tons. The optimum yield (OY) for the 1980-81 fishing season within the U.S. Fishery Conservation Zone was 179,000 short tons as determined by the OY formulation adopted by the Pacific Fishery Management Council's Anchovy Plan. The 1980-81 U.S. reduction quota for the northern anchovy was set at 166,400 short tons. In the fall of 1980 the California Fish and Game Commission established an 80,000 short ton limit on the amount of anchovy that could be processed by shore-based reduction plants in California.

Administrative Reports

Honolulu Laboratory

Court, William G. 1981. Recent trends in the Japanese fishery for squid, Ommastrephes bartrami. SWFC Admin. Rep. H-81-8.

Skillman, Robert A., and Bernard M. Ito. 1981. The present status of the spiny lobster fishery in Hawaiian waters. SWFC Admin. Rep. H-81-7.

La Jolla Laboratory

Stuntz, Warren E. 1981. The tuna-dolphin bond: A discussion of current hypotheses. SWFC Admin. Rep. LJ-81-19.

Approved by Center Director

Dahlheim, Marilyn E., Stephen Leatherwood, and William F. Perrin. Distribution of killer whales in the warm temperate and tropical eastern Pacific. For consideration for publication in the International Whaling Commission 1981 Annual Report.

Hudgins, Linda L., and Gary L. Kamer. Fish size and price: The general case. For consideration for publication in American Journal of Agricultural Economics.

Jemison, Howard A., III, Andrew E. Dizon, and Michael M. Walker. An automatic feeder for liquids or wet or dry solids. For consideration for publication in Behavior Research Methods and Instrumentation.

Perry, A., G.B. Bauer, and A.E. Dizon. Magnetite in the green turtl . (Abstr.) For consideration for publication in Transactions of the American Geophysical Union Fall Meeting, San Francisco, California, December 7-11, 1981.

Polacheck, Tom, and Tim D. Smith. Density dependent changes in the survival rate of juvenile fur seals (Callorhinus ursinus). For consideration for publication in the Canadian Journal of Fisheries and Aquatic Sciences.

Polacheck, Tom, and Tim D. Smith. A simulation model of the fur seal (Callorhinus ursinus) population breeding on St. Paul Island, Alaska. For consideration for publication in the Canadian Journal of Fisheries and Aquatic Sciences.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Report Prepared for Groundfish Conference

This month Richard N. Uchida, Leader of the Insular Ecosystem Study Task, continued to work on a report which he will present at the Western Groundfish Conference to be held in Gleneden Beach, Oregon, November 18 to 20, 1981. The report will include the results of bottom trawling conducted by the NOAA Ship Townsend Cromwell, on the North Pacific seamounts near the Northwestern Hawaiian Islands (NWHI). The 12 trawl hauls made over Northwest Hancock Seamount produced a total of 1,742.5 kg of armorhead, Pentaceros richardsoni, and 89.1 kg of alfonsin, Beryx splendens. The average catch per 30-min haul was 367.2 kg for all species. At Southeast Hancock, seven trawl hauls produced 3,534.1 kg of armorhead whereas the alfonsin catch was only 57.6 kg. The average catch per 30-min haul was nearly double that obtained at Northwest Hancock, reaching 674.2 kg for all species. In addition to armorhead and alfonsin, the trawl hauls included relatively good catches of mirror dory, Zenopsis nebulosa, dogfish, Squalus spp., snake mackerel, Promethichthys prometheus, driftfish, Ariomma lurida, and red bigeye, Priacanthus boops.

Lobster Samples and Data Examined

Research Assistant James H. Prescott reports that lobster leg length data collected on cruise TC-81-04 and data from frozen lobster heads collected on previous cruises have been keypunched. Data from the frozen heads will add to the data base; unfortunately, however, most of the heads were collected from banks where the lower end of the size range of lobster remains virtually unsampled. Leg measurements made both while the lobsters were alive and then after freezing are presently being analyzed to determine whether the freezing-thawing process causes any significant change in the length of the leg. If there is no change the data will be pooled for analysis.

Research Assistant Victor A. Honda has completed laboratory processing of eggs collected from spiny lobsters, Panulirus marginatus, and has begun working with Research Assistant Darryl T. Tagami on the analysis of the data. Honda and Tagami compared the slopes of the regression line describing the relationship between carapace length and the number of eggs and found no significant differences for samples collected at Necker Island and at Maro Reef.

Stomach Contents of Bottom Fish Analyzed

This month Research Assistants Robert L. Humphreys, Jr., Steven H. Kramer, and Michael P. Seki continued to examine the stomach contents of bottom fish. Seki also stained the vertebrae of species belonging to the

families Bothidae, Congridae, and Tetraodontidae. The stained vertebrae will be used as references in identifying items in the stomachs of pig ulua, Caranx cheilio. Seki noted that the major food items of the pig ulua include many members of these three families.

* * * * * * * * * *

Research Assistant Darryl T. Tagami worked with Computer Technician Brent Miyamoto to machine edit handline fishing catch data from several Northwestern Hawaiian Islands (NWHI) cruises and with Research Assistant Jeffrey D. Sampaga to edit cruise data. Tagami also assisted Fishery Biologist James H. Uchiyama with computer summaries of data which will be included in a "Fishery Atlas of the Northwestern Hawaiian Islands," which is now in preparation.

Paper Presented at Ocean Thermal Energy Conversion Workshop

Fishery Biologist Richard N. Uchida prepared a report reviewing the biological characteristics of waters around Guam for presentation at a Workshop for Ocean Thermal Energy Conversion (OTEC) Informational Requirements, held October 20 to 22 at the Southwest Fisheries Center, La Jolla Laboratory.

Workshop participants discussed informational requirements on the effects of water displacement on substrate, plankton, fish eggs, larvae, juvenile and adult fish, shellfish, and coral reef in order to develop guidelines for potential OTEC developers. Other participants at the workshop included Dean Parsons and Jim Chambers, NMFS Habitat Protection Division; Lowell Martin and Ed Myers, NOAA Ocean Minerals and Energy; Jim Slawson and John Naughton, NMFS Southwest Regional Office; Don Hoss, NMFS Beaufort Laboratory; and Ron Lynn, NMFS La Jolla Laboratory (see related story in Albacore Program, Coastal Fisheries Resources Division, La Jolla Laboratory, this issue).

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This month Fishery Biologist Reginald M. Gooding worked on an Administrative Report on the predation of uluas and sharks on surface- and bottom-released spiny lobsters, and on a note for publication on the same subject. He also summarized data from Townsend Cromwell cruise 81-04 for the Narrative Report of the cruise and worked on a questionnaire which will be sent to all researchers who are engaged in NWHI resource studies. The information from the questionnaire will be used in the development of the narrative theme for the projected 16-mm movie film documenting the 5-year NWHI resource study. The film will be jointly produced by the Tripartite agencies and University of Hawaii Sea Grant.

Hawaiian Deep-Sea Handline Fishery Described in Manuscript

Dr. Jeffrey J. Polovina, Leader of the Resource Assessment Investigation of the Mariana Archipelago (RAIOMA), reports that revisions have been completed on a manuscript, "A multispecies analysis of the commercial deep-sea handline fishery in Hawaii," which is being prepared by Polovina and Dr. Stephen Ralston, Fishery Biologist on an IPA assignment to the Honolulu Laboratory from the University of Washington, Seattle. The manuscript has been accepted for publication in the U.S. Fishery Bulletin.

Ralston and Polovina examined catch and effort data for 13 species of bottom fish taken in the commercial deep-sea handline fishery around the main Hawaiian Islands. The Schaefer stock production model was applied to several levels of species aggregation. An intermediate level of aggregation explained more of the variation in total catch than did the total biomass model. An estimate of MSY of 272 kg/nmi of 100-fathom isobath was obtained for this fishery.

* * * * * * * * * *

Robert B. Moffitt, Fishery Biologist, continued to sort and identify biological material collected on cruises. Samples collected on the Typhoon charter around Guam and the Northern Marianas included considerable numbers of another caridean shrimp, Heterocarpus longirostris, which closely resembles H. laevigatus.

Sorting and Cataloging of Honolulu Laboratory Invertebrate Collection Continues

Beatrice L. Burch, Invertebrate Collection Manager of the Bernice P. Bishop Museum, reports that the sorting and cataloging of corals collected on R/V Townsend Cromwell cruises continues. Most of the corals collected on the Cromwell cruises are from deep water and will nicely complement the large reef coral collection at the Bishop Museum. Approximately 1,400 coral specimens were sorted out from collections made on the Cromwell. Much of this material consists of several varieties of Flabellum pavoninum or Stephanophyllia cf. neglecta. A sample of 420 specimens has been sent to Dr. Steven Cairns of the Department of Invertebrate Zoology, U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C., for identification.

Work was also begun on the sorting of material collected with the Cobb pelagic trawl, including samples collected at 72 stations (TC-32) in Hawaiian waters and 124 stations made on six cruises (TC cruises 43, 44, 45, 46, 47, and 48) in the central equatorial Pacific between lat. 14°N and 3°30'S on long. 145°W. Because of the large volume of material collected on many of the stations, the samples will be divided into manageable sizes, then completely sorted. Initial attempts will only involve identifying the shrimps which have been sorted from the Euphausiidae and Mysidae in the split samples.

FISHERY MANAGEMENT RESEARCH PROGRAM

Progress Made in Contract Work on Economic Studies

Dr. Robert A. Skillman, Fishery Biologist, reports that progress has been made this month on the contracts for economic data collection for the Honolulu Laboratory. The contractor for the Vessel Inventory Survey has submitted data on magnetic tapes of all vessels in the public record for American Samoa, Guam, Hawaii, and the Commonwealth of the Northern Mariana Islands, as well as a final report in draft. The purpose of this project is to provide an information base for use in conducting economic surveys on specific sectors of the fishing industry. Fishery Management Research Program (FMRP) researchers have participated in several meetings with other Laboratory staff as well as with the Western Pacific Regional Fishery Management Council (WPRFMC) staff in designing the second phase of this contract, to verify and classify the vessels on the public record.

The statistical design of the Survey of Hawaiian Wholesale Fish Dealers has also been completed and FMRP researchers have been meeting with the contractor to complete procedures for the field collection of data. Data collection should be started in November. In addition, the contract to conduct a cost/earnings survey of tuna longline, deep-sea bottom fish, and ika-shibi fishing boats in Hawaii, has been let to Hawaii Opinions, Inc.

Implementation of the Central and Western Pacific Fishery Information Network Continuing

David C. Hamm, Computer Systems Analyst, reports that the Honolulu Laboratory (HL) has received the first two microcomputer systems comprising part of the hardware for the Fishery Information Network (FIN). One of the systems has been installed in Hamm's office, and the other was installed in the Hawaii Division of Aquatic Resources office on October 30, 1981. Hardware and software are being pre-tested by Hamm to insure system integrity and compatability. The remaining microcomputer systems will be tested and distributed to government fisheries offices in American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands during the next few months. Hamm will be training the fisheries agency personnel who will be working with FIN in each of the island areas.

The contract with the East-West Center (EWC) for main frame computer support for FIN has been completed, and work is proceeding toward integrating FIN on the EWC computer. Agreement has been reached on the initial hardware requirements, and the EWC has ordered the equipment. The hard-wire communications cable has been installed between the EWC and HL buildings, and individual hookups will begin when the other hardware becomes available. The EWC expects to receive their new PDP 11/70 processor by mid-November, and plans to have all FIN main frame components implemented by the end of December 1981.

During October, Hamm was involved in a number of planning and work sessions with HL staff, WPRFMC staff, WPRFMC's Scientific and Statistical Committee (SSC) members, and island governmental agency representatives. Issues of concern included transition from the Historical Data Compilation Project to implementation of a real time FIN system; scheduling of installation of the microcomputer systems and training of personnel; establishment of fisheries data collecting systems in the western Pacific island areas and possible upgrading of existing data collecting systems; establishment of a data collecting system with the Guam Fisherman's Coop; and implementation of the Vessel Classification Project. Progress was made in all areas, with the group agreeing to cooperate and commit themselves to the implementation of FIN.

Cumulative Hawaiian Skipjack Tuna Landings in 1981 Far Below Long-Term Average

The October 1981 Hawaii landings of skipjack tuna were estimated at 86 metric tons (MT), which is 4 MT below the October 1980 landings and 161 MT below the 1964-79 long-term average for October. The cumulative landings from January through October were estimated at 2,027 MT, which is 511 MT above the 1980 landings for the same period and 1,665 MT below the 1964-79 long-term average for the same period (Figure 1).

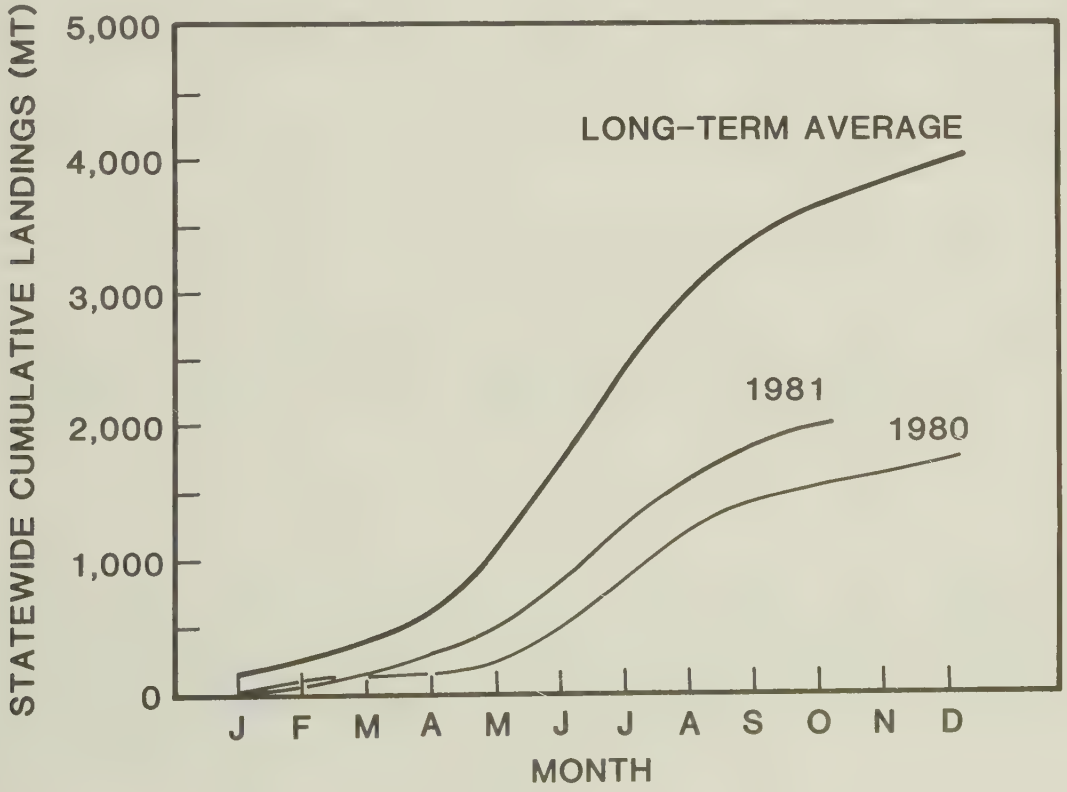


Figure 1. Cumulative landings in the Hawaiian skipjack tuna fishery.

PELAGIC RESOURCES INVESTIGATION

Analysis of Seabird Diet Data Continues

Fishery Biologist Thomas S. Hida reports that Computer Programmer Sally Kuba has provided him with computer summarizations of seabird diet data (1 for each of 18 species studied). These summarizations include:

1) Prey items by fish families and major invertebrate groups together with their number, percent frequency of occurrence, average percent volume, and ranking.

2) Prey items by the lowest taxon to which the prey were identified, together with the same type of information in 1).

3) Prey items by fish families and major groups of invertebrates, separated into island groups and seasons (includes their number, percent frequency of occurrence, and average percent volume).

4) Prey items by the lowest taxon to which the prey were identified, separated into island groups and seasons (includes their number, percent frequency of occurrences, and average percent volume).

5) Prey items with their minimum, maximum, and average length measurements (only reliable measurements were used).

6) Prey items in good condition with their minimum, maximum, and average displacement volumes.

7) Prey items in fresh to relatively fresh condition by the earliest, latest, and average times of collection (time of sampling).

Also prepared were summaries of the minimum, maximum, and average length measurements of all prey items combined (only reliable measurements were used); the minimum, maximum, and average displacement volumes of all prey items (in good condition) combined; and a pie diagram (in percentages) of the food items in the seabird diet.

Tuna Energetics Experiments Continue

This month Christofer Boggs, University of Wisconsin graduate student, has been measuring the energetic costs of swimming in tunas. Tunas from the same school were analyzed at time of capture in order to provide equations for back-calculating the initial energy content of experimental fish. Changes in whole animal density, water content, and weight were measured for the reference group of tunas; these measurements will provide a direct indication of the total energy content of individual experimental fish that have been starved or fed measured quantities for known periods of time.

The initial weight of growing fish cannot be back-calculated from final length; therefore a technique was developed for making periodic measures of live weight. Over 50 tunas were weighed, many repeatedly, with only two subsequent mortalities attributable to the handling procedure. Drying hundreds of whole tuna for the reference measurements presented a major logistical problem; this was solved by the development of a procedure which allows the use of a single standard sample of tissue as a predictor of whole fish energy density variables. The wet:dry ratio of whole fish (y) as a function of the standard sample (x) for skipjack tuna is:

$$y = -0.179 + 1.05\ x \qquad (n = 60,\ r^2 = 0.98),$$

and for kawakawa:

$$y = -0.315 + 1.1\ x \qquad (n = 45,\ r^2 = 0.94).$$

Preliminary analysis of a few samples shows that caloric density (cal g^{-1} dry weight) of whole skipjack tuna (y) is closely predicted by caloric density of the standard sample (x):

$$y = -1442 + 1.324\ x \qquad (n = 8,\ r^2 = 0.95).$$

Energy losses of starved skipjack tuna swimming at measured speeds roughly match the energy consumption predicted by theoretical power models and independent measures of respiration. These three methods of estimating energy expended by swimming skipjack tuna are compared in Table 1. The skipjack tuna swam at speeds between 1.3 and 2.1 body lengths per second, requiring a remarkable rate of energy output. These results confirm that 1) routine metabolism in skipjack tuna is much greater than in other fish and 2) skipjack tuna are less efficient swimmers than many other fish (notably salmonids) at these speeds.

Table 1.--Comparison of three methods for estimating energy expended by swimming skipjack tuna.

Fish No.	Days starved	Theoretical power	Oxygen consumption	Calorimetry (this experiment)
1	7	5.6×10^5 cal	5.9×10^5 cal	1.04×10^6 cal
2	14	5.4×10^5 cal	3.7×10^5 cal	7.5×10^5 cal
3	18	7.6×10^5 cal	6.5×10^5 cal	5.9×10^5 cal
4	22	1.15×10^6 cal	1.02×10^6 cal	1.21×10^6 cal

Analysis of the feeding experiments is incomplete but preliminary results indicate that growth rates of captive skipjack tuna were only one-half to one-third of those predicted by the above measures of swimming cost. This may be due to the artificial environment, stress, or the use of frozen smelt for food.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

Coastal Resources Scientists Attend 1981 CalCOFI Meeting

This month scientists from the Coastal Fisheries Resources Division of the La Jolla Laboratory attended the 1981 annual meeting of the California Cooperative Fisheries Investigation (CalCOFI) held in Idyllwild, California, October 26-29. The conference, chaired by Dr. Reuben Lasker, Chief of the Coastal Division and CalCOFI Coordinator, was dedicated to the memory of John Radovich of the California Department of Fish and Game. An outstanding fishery scientist and strong supporter of the Marine Research Committee and CalCOFI, Radovich exemplified the cooperative scientific spirit that characterizes the CalCOFI program.

Scientists from institutions as far away as Seattle, Washington, and La Paz, Mexico, presented papers and took part in discussions. Papers were presented by Coastal Division personnel, and by scientists from the SWFC's Pacific Environmental Group, University of California, California Department of Fish and Game, various Mexican universities (CICIMAR and CICESE), and other agencies. A highlight of this year's meeting was a symposium on "Reminiscences of California Fishery Research and Management," chaired by Professor Joseph L. Reid, Director of the Marine Life Research Group at Scripps Institution of Oceanography.

Speakers at the Symposium included Dr. Frances Clark, Marine Biologist, who was the Director of the California Department of Fish and Game State Fisheries Laboratory at Terminal Island from 1942-1957. During the war years from 1945-1946, she also served as the Acting Chief of the Bureau of Marine Fisheries in Sacramento. Dr. Clark, who originally came to work for the California Department of Fish and Game in 1917, spoke on "California Marine Fisheries Investigations, 1914-1939."

Dr. Clark was followed on the program by Richard Croker, Chief of the California Department of Fish and Game's Bureau of Marine Fisheries from 1946 until his retirement in 1962. Mr. Croker's career as a marine biologist with the State fisheries agency began in 1929. His talk was titled, "An Iconoclast's View of California Fisheries Research, 1929-1962."

Jack Baxter, who is the California Fish and Game Regional Manager, Marine Resources Region, State Fisheries Laboratory, Long Beach, played a leading role in CalCOFI and the Marine Research Committee (MRC) during the 1960s. A marine biologist who joined the California Department of Fish and Game in 1951, Mr. Baxter has held a number of top-level positions in research administration and fisheries management in the state agency. His talk centered on the role of the MRC and CalCOFI.

Professor Reid spoke next on "An Oceanographer's Perspective." Professor Reid's association with Scripps Institution of Oceanography began in 1948 when he came to La Jolla as a graduate student in oceanography. His scientific career has focused on descriptive physical oceanography and interdisciplinary studies involving biology.

Pat Powell, Head Librarian of the California State Fisheries Laboratory from 1946 to 1976 and subsequently supervisor of the state's Marine Technical Information Center from 1957 until her retirement in 1976, is a friend and colleague of most leading marine scientists involved in CalCOFI research. Ms. Powell's talk, "Personalities of California Fishery Research," dealt with her recollections of many of these colorful individuals.

Dr. Art McEvoy, a recent Ph.D. graduate of the University of California, San Diego, and now an assistant professor of history at Northwestern University, was the last symposium speaker. The subject of his presentation was "Scientific Research and the 20th Century Fishing Industry.". Dr. McEvoy, whose Ph.D. thesis dealt with the history of California fisheries, focused his talk on the legal, economic and social problems of applied fishery management.

Pat Powell, former California Department of Fish and Game head librarian at Terminal Island and Dr. Reuben Lasker, CalCOFI Coordinator and Chief of the Coastal Fisheries Resources Division at the La Jolla Laboratory.

Professor Joseph Reid of the Scripps Institution of Oceanography, University of California and Dr. Frances Clark, former long-time head of the California Department of Fish and Game State Fisheries Laboratory at Terminal Island, talk over old times at the CalCOFI Conference at Idyllwild, California.

Principal speakers in the symposium on "Reminiscences of California Fishery Research and Management": From left - Joseph Reid, Richard Croker, John Baxter, Pat Powell, Art McEvoy, and Frances Clark.

The following papers were presented by SWFC personnel at the conference:

Bakun, A. and R. H. Parrish - "Transport, turbulence, and pelagic fish in the California and Peru Current systems."

Brewer, G. and P. Smith - "Northern anchovy and Pacific sardine spawning off southern California during 1978-80: Preliminary observations on the importance of the nearshore coastal region."

Hewitt, R. P. - "Evidence for a compensatory mechanism in the northern anchovy larval population."

Hunter, J. R. and H. Dorr - "Thresholds for filter feeding in northern anchovy, Engraulis mordax."

Husby, D. M. and C. S. Nelson - "Seasonal distributions of wind mixing energy and vertical stability off the west coast of North America."

Loeb, V. J., P. E. Smith, and H. G. Moser - "Recurrent groups of larval fish species in the CalCOFI area."

MacCall, A. D. - "Longshore variability patterns of larval anchovy abundance."

Mallicoate, D. L. and R. H. Parrish - "Variation in the condition factor of northern anchovy (Engraulis mordax) sampled in the southern California fishery."

Owen, R. - "Microscale plankton patchiness on the Chimbote Shelf, Peru."

Owen, R., A. Alvariño, and R. Recht - "Plankton in upwelling plumes off southern California."

Parrish, R. H. and D. L. Mallicoate - "Regional variations in the growth and age composition of northern anchovy (Engraulis mordax)."

Pelaez, J. and F. Guan - "Preliminary results of a new procedure for measuring chlorophyll-like pigments from satellite: Comparison with shipboard concentrations."

Phillips, G. M. - "Time series casual modeling of daily anchovy landings: Some implications for catch forecasting and Schaefer-type models."

Pommeranz, T. and G. Moser - "Vertical distribution of anchovy eggs and larvae at two CalCOFI stations in March-April 1980."

Smith, P. E. and R. P. Hewitt - "Spatial inferences from replicate samples of anchovy eggs."

Smith, P., H. Santander, and J. Alheit - "Comparison of some egg sample probability distributions of eggs of anchoveta (Engraulis ringens) and northern anchovy (Engraulis mordax) off California and Mexico."

Stauffer, G. D. and R. L. Charter - "The northern anchovy spawning biomass for 1981."

LARVAL FISHES, COASTAL EAST PACIFIC PROGRAM

Diet-Induced Differences in Growth Rates of Larval Northern Anchovy Studied

This month Fishery Biologist Gail Theilacker examined the effect of diet on the weight and length of larval northern anchovy as part of a continuing series of feeding experiments. Theilacker's objective is to determine how variations in prey type and density affect larval fish feeding rates, daily ration, evacuation, growth (increase in size and dry wieght), and gross growth efficiencies.

For this part of the study, three groups of anchovy larvae were each fed a different diet: a rotifer diet at two prey levels and a copepod diet. Rotifer densities were maintained in the rearing containers at 2/ml and 25/ml for the 16-day experiment; however, the copepod treatment (usually 1 nauplius and 1 copepodite per ml) was maintained only through day 9 due to problems with the copepod rearing tanks. Therefore growth rates on the three diets are only compared for days 5 to 9.

To insure accurate dry weight determinations, larvae were grouped by size class for the dry weight measurements. Larvae less than 5 mm were grouped by 0.2 mm size classes, and those greater than 5 mm were grouped by 0.3 mm size classes. The larger the larval size, the fewer the group number. Thus, the case numbers listed in the covariate analyses in Table 1 contain from 2 to 12 larvae, depending upon individual body size.

Table 1

Effect of Diet on Larval Anchovy Standard Length (SL) and Dry Weight (WT)

A/

Diet	Density per ml	No. Cases	AGE =7d X SL mm	AGE =7d X WT µg	PROBABILITIES =slopes	PROBABILITIES =SL and =WT 1 vs 2	1 vs 3	2 vs 3
					SL/WT	SL/WT	SL/WT	SL/WT
1. Rotifers	25	34	4.81	32.38				
2. Rotifers	2	14	4.61	31.27	.22/.32	.20/71	.00/00	.00/00
3. Copepods	2	28	5.29	40.59				

B/

			SL =4.9mm X WT ug			
1. Rotifers	25	34	30.75	.30	0.11	0.00
2. Rotifers	2	14	33.25			
3. Copepods	2	28	28.54			

An analysis of covariance was used to test for diet-induced differences in length and weight relationships; all data, except age, were transformed to natural logs. Theilacker asked two questions: 1) Does diet affect larval weight and length at a given age, and 2) does diet affect larval weight at a given length? Analysis indicates that larvae which fed on copepods were significantly larger and heavier at age than larvae eating rotifers (Figure 1A and 1B); there were no length or weight differences at age between the two rotifer treatments. Larvae raised on the two rotifer diets also were the same weight at standard length; larvae raised on copepods, however, weighed less at length than larvae on the rotifer diets ($p = 0.006$ and 0.01, respectively; Figure 1C). It seems that the larvae grow faster and have a longer body length when fed copepods, but do not put on as much weight per unit length as those fed on rotifers. No attempt is being made to explain these results until the daily rations have been calculated.

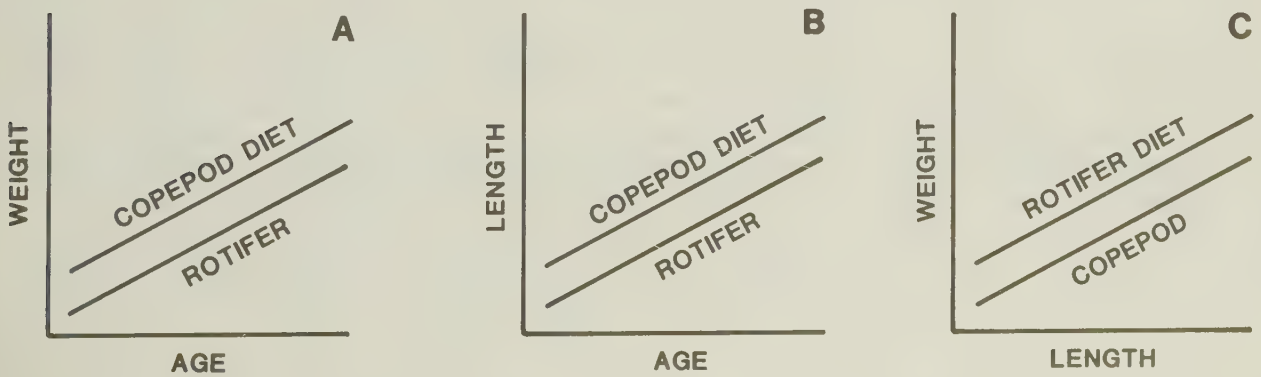


Figure 1. Effects of diet on larval anchovy growth patterns.

ALBACORE FISHERIES GROUP

OTEC Informational Requirements Workshop Held at Center

This month Oceanographer Ron Lynn acted as host for a workshop on Ocean Thermal Energy Conversion (OTEC) Informational Requirements held at the Southwest Fisheries Center, October 20-22; Dean Parsons of the National Marine Fisheries Service Habitat Protection Office, Washington, D.C., served as convenor and workshop leader. Workshop participants reviewed the regulatory framework of the OTEC Act and the informational requirements of the Act as they bear upon a license applicant and the NOAA elements who make environmental impact assessments. By providing guidance to applicants during the pre-application period, the required impact assessments can be completed in an effective and efficient manner.

Background materials on pilot OTEC projects and impact studies were presented and discussions were held on the pertinent portions of the Endangered Species Act, Marine Mammal Protection Act, and Fish and Wildlife Coordination Act. One expected applicant is the government of Guam, so the characteristics of the ocean and fisheries about Guam were also discussed.

Parsons is preparing a draft of the workshop recommendations for future distribution. (See related story in Insular Resources Investigation, Honolulu Laboratory, this issue.)

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH AND MANAGEMENT

Progress Report Given on Revision of Anchovy Management Plan

This month Fishery Biologist Dr. Gary Stauffer, representing the anchovy plan development team, presented a progress report on the team's revision of the anchovy fishery management plan (FMP) to the Pacific Fishery Management Council (PFMC), the Council's Scientific and Statistical Committee, and the Advisory Subpanel during Council meetings in Los Angeles, California, October 6-7. Alec MacCall, California Department of Fish and Game Marine Biologist stationed at the Southwest Fisheries Center, accompanied Stauffer as co-chairman of the anchovy plan team. As reported in the September 1981 issue of the Center Monthly Report, a complete FMP revision is in progress with emphasis on the size limit, biomass measurement and yield, and incorporation of Mexico's harvest. The PFMC held a "scoping session" on October 7 to collect public comments and suggestions for this revision. The Council

instructed team members to incorporate alternative season and limited entry regulations, as well as the aforementioned items, in the draft plans to be presented on January 26-27, 1982.

Data Base for U.S. Fish Meal Markets Established

Cindy Thomson, formerly a student employee at SWFC, returned to the Center this month on a 30-day appointment to work for Program Leader Dr. Daniel Huppert while Industry Economist Jane McMillan is in Rome, Italy, working for FAO. With the assistance of Computer Programmer Susan Iacometti, Thomson has established a data base for developing a monthly commodity market model addressing U.S. fish meal markets. Thomson gathered the data through an extensive search of government publications and telephoning knowledgeable experts; Iacometti transferred pertinent time-series data from the ADP econalyst data bases to the UCSD VAX system.

San Pedro Anchovy Fishery Landings Analyzed

Mike Phillips, UCSD economics graduate student at the La Jolla Laboratory, has reported preliminary results of a time-series analysis of daily San Pedro anchovy fishery landings. Using auto-regressive analysis of "effort" (defined as one day's fishing by one vessel) and "catch per effort," Phillips has shown that catch per effort "causes" effort but not vice versa; that is, changes in daily catch per effort are statistically associated with changes of the same sign in subsequent levels of effort. Increasing or decreasing effort, however, is not associated with changes in subsequent catch per effort. The result confirms the usual assumption in economic models that "supply" (in this case effort and catch) responds to profitability (the profits are presumed to be greater with higher catch per effort). This provides an interesting alternative to the standard "Schaefer" model assumption which associates greater effort with lower catch per effort. Since the Schaefer model addresses long-run equilibrium condition, while Phillip's result pertains to a very short-run response, the two theoretical constructs are not mutually exclusive. An important question still to be determined is whether supply response or biological equilibrating mechanisms dominate the annual data normally available for fisheries.

Work Continues on the 1981 Egg Production Estimate

During October the laboratory work and computer processing of CalVET egg samples and midwater trawl samples were completed. The resulting computer files were turned over to Dr. Gary Stauffer, Fishery Biologist, and Susan Picquelle, Statistician, for use in estimating anchovy biomass and for calibrating the egg production and larva census estimates of biomass. Both of these results should be available by early November for use in the revision of the anchovy fishery management plan.

* * * * * * * * * *

On October 21 Alec MacCall, California Department Fish and Game Biologist stationed at the SWFC, chaired a workshop at the Center on "Anchovy Time Series Reinterpretation." The workshop was a problem-solving effort to expedite the calibration of historical anchovy larva censuses to "egg production equivalents." Workshop participants included Dr. Reuben Lasker, Chief of the Coastal Fisheries Resources Division; Rich Charter, CalCOFI Data Manager; LCDR Roger Hewitt, NOAA Corps; Dr. Nancy Lo, Mathematician; Dr. Paul Smith and Dr. Gary Stauffer, Fishery Biologists.

MULTISPECIES TAXONOMY PROGRAM

Plans Made for Ahlstrom Memorial Symposium/Book

This month Dr. Geoff Moser, Program Leader, chaired a meeting of the steering committee selected to plan a symposium on "Ontogeny and Systematics of Fishes," and to edit the resultant papers. The symposium will be dedicated to the memory of Dr. Elbert Halvor Ahlstrom, former Director of the Southwest Fisheries Center and a pioneer in the field of larval fish biology. The committee, consisting of Moser, Dr. Arthur Kendall (Northwest and Alaska Fisheries Center), Michael Fahay (Northeast Fisheries Center), Dr. William Richards (Southeast Fisheries Center), and Dr. Sally Richardson (Gulf Coast Research Laboratory) met at Environmental Research Laboratories, Boulder, Colorado, on October 20-22, and produced a complete plan for the symposium and book. The proposal will be forwarded to the National Marine Fisheries Service Research Council for approval.

* * * * * * * * * *

The Multispecies Taxonomy Program has obtained a pH meter which will permit direct monitoring of pH values in the 2-dram vials which are the principal storage containers of the larval specimen collection. Biological Technician Betsy Stevens has begun to spot-test the archived collection; a regular monitoring program will be established soon.

Manuscripts Describe Early Life Histories of Several Marine Species

Biological Technician Betsy Stevens continued to work this month on a manuscript describing reproduction and development of the blenny, Hypsoblennius jenkensi, and Fishery Biologist Barbara MacCall made progress in preparing a manuscript describing larvae and early juveniles of important species of Carangidae (jacks) in the CalCOFI region. Biological Technician

Elaine Sandknop and Biological Aid Morgan Busby spent most of the month preparing a distributional analysis of croaker larvae taken in CalCOFI samples.

SURVEY SYSTEMS DEVELPMENT AND EVALUATION

Historical Time Series of Anchovy Egg Census Developed

This month Program Leader Dr. Paul Smith, LCDR Roger Hewitt (NOAA Corps), CalCOFI Data Manager Richard Charter, and Biological Technician Cynthia Meyers completed a 5-month project to add the anchovy egg samples to the standard CalCOFI data files and to report the anchovy egg data. These data will be used to: 1) provide a cruise-by-cruise egg census estimate to Mathematician Dr. Nancy Lo so that she can calculate the level and variation of embryonic survival rates; 2) allow Smith, Dr. Haydee Santander of IMARPE, and Dr. Jürgen Alheit of PROCOPA to compare sampling techniques for the Peruvian anchoveta and anchovy, and 3) provide an annual time series of anchovy eggs to Alec MacCall, California Department of Fish and Game Marine Biologist stationed at the SWFC, so that the anchovy management plan can be modified using a quota setting method by egg production, which requires data from only a single cruise, rather than the larval census method, which requires data from four cruises.

Figure 1 illustrates the first approximation of the time series of egg and larval production. The evaluation uses a constant escapement through the mesh, a 10-m temperature correction for duration, a variable embryonic mortality (A), and a constant embryonic mortality (B = -0.38).

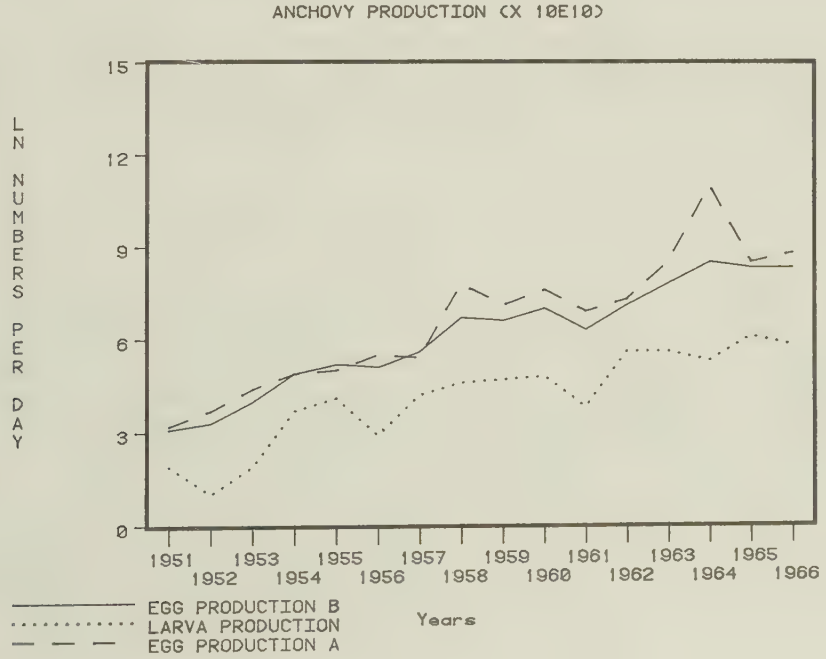


Figure 1. Approximation of time series of anchovy egg and larval production.

Oceanic Fisheries Resources Division

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

Symposium Volume on Population Dynamics of Large Mammals Published

Dr. Tim Smith, Program Leader, reports that "Dynamics of Large Mammal Populations," which explores how populations of large-bodied mammals change over time, has just been published by Wiley and Sons. The volume, edited by Smith and Dr. Charles Fowler, Northwest and Alaska Fisheries Center, contains the results of a conference on large mammal populations which was sponsored by Fowler and Smith in the summer of 1978 at Utah State University. The purpose of the conference was to bring together scientists studying the population dynamics of large mammals, both marine and terrestrial, in order to promote the integration of large mammal population studies, particularly those of a more quantitative nature, into a comparative science.

Scientists throughout the world have contributed to the volume, including some who work at or have been frequent visitors to the Southwest Fisheries Center: Douglas DeMaster ("Incorporation of density dependence and harvest into a general population model for seals"), K. Radway Allen ("Application of population models to large whales"), L. L. Eberhardt ("Population dynamics of the Pribilof fur seals"), Douglas C. Chapman ("Evaluation of marine mammal population models"), Daniel Goodman ("Life history analysis of large mammals"), and Tom Polacheck ("Reexamination of the life table for northern fur seals with implications about population regulatory mechanisms").

The book is dedicated to Dr. Richard Laws, currently of the British Antarctic Survey, Cambridge, England, in recognition of his enormous influence on the study of both the biology and the population dynamics of large mammals; the volume includes Laws' keynote address to the conference.

Total Kill of Dolphins Estimated for Remainder of Year

Bruce Wahlen, Biological Statistician, has devised and implemented a method for projecting total kill of dolphins in the U.S. yellowfin tuna fishery in the eastern tropical Pacific; the projection is needed in order to anticipate the possibility of closing the fishery if the total dolphin kill should exceed the annual quota. Based on the cumulative kill and kill rates to date in 1981, Wahlen projects the total annual kill as:

$$\text{estimate to date} + \text{kill per day} \times \left(\begin{array}{l}\text{the average number of days at sea}\\ \text{in 1978, 1979, and 1980 during each}\\ \text{of the remaining months.}\end{array}\right)$$

The cumulative kill throughout the year is shown in Figure 1. The uncertainty in the estimated kill-to-date is estimated based on sampling variability from the 1981 observer data, as shown by the 95% confidence interval on the October 25 estimate. The uncertainty in the projected kill levels is estimated by also including the variability of the mean number of days at sea over the three years 1978-1980. This uncertainty is shown by the 95% confidence interval for the December 20 projection.

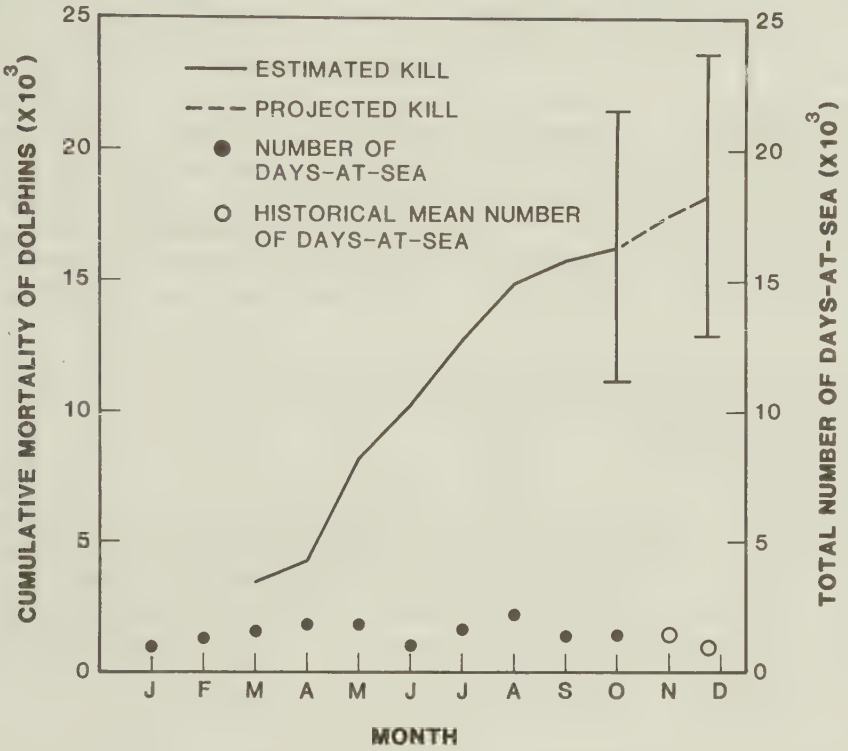


Figure 1. Cumulative mortality of dolphins associated with the yellowfin tuna fishery in 1981.

Tuna Boat Observer Data Being Entered on VAX

The data collected by National Marine Fisheries Service observers on tuna boats are being entered into data bases on the VAX computer system, using a method designed and implemented by Computer Programmer Ken Wallace. Each year's data are somewhat different, requiring separate computer programs. To date, the 1981, 1980, 1979, and 1978 bases have been completely implemented and tested. The remaining year's data are nearly implemented, including the 1971 to 1973 data which have been transferred to 1975 formats by Biological Technicians Bob Franco, Tom Gronholt and Mike Gregory.

MARINE MAMMAL BIOLOGY PROGRAM

Marine Mammal Carcasses Salvaged for Research

From September 25 to October 25, 20 marine mammal carcasses were recovered by the Cooperative Marine Mammal Salvage Program, whose primary participants are the Southwest Fisheries Center, the Naval Oceans Systems Center, and the Hubbs-Sea World Research Institute. Seven specimens were collected on San Miguel Island, three on San Clemente Island, and the rest from San Diego County mainland beaches. Six were cetaceans (of 3 species), one was a harbor seal (Phoca vitulina), and the others were California sea lions (Zalophus californianus). One sea lion was a shark-attack victim while another was a gunshot victim; all the other specimens were too decomposed to determine cause of death. The collected specimens are measured, sexed, and a tooth sample is collected for age determination studies. Freshly dead specimens are returned to the SWFC for necropsy to determine cause of death.

California Sea Lion Food Habit Study Started at San Clemente Island

Biological Technician Mark Lowry has begun a food habits study of the California sea lion, Zalophus californianus. On October 14 and 15 Lowry traveled to San Clemente Island and collected scat samples from the sea lion haul-out area. On October 21 he visited Brent Stewart at Hubb's Seaworld Research Institute to discuss the technique Stewart uses to analyze scat samples. The few samples rough-processed so far have contained fish otoliths, various fish bones, and eye lenses.

Study Completed of Time Calibration of Dental Layers in Tetracycline-labeled Hawaiian Spinner Dolphins

Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, reports the completion of the first draft of a manuscript describing the use of tetracycline-labeled Hawaiian spinner dolphin teeth to determine the time content of dental layers. Myrick studied teeth from seven dolphins, including one captive-born animal which had been labeled during clinical treatments with tetracycline during captivity at Sea Life Park, Hawaii. Labels, revealed in dental tissues under ultraviolet light, were identified with treatment dates as determined from clinical records. This permitted documentation of tooth layering rates in teeth in each animal and comparison of rates between animals.

The study found that one annual layering pattern (GLG) contains two dark and two light sublayers. It also contains 13 fine lunar monthly layers (LML)s, seven of which occur in the first dark/light sublayer pair and six in the second dark/light sublayer pair. The first GLG begins to form at birth and each subsequent GLG begins to form on the corresponding anniversary. If the date of death is known, the approximate month of birth may be determined by counting LMLs and GLG anniversary sublayers. Myrick determined that five animals in the sample were born in early fall (August-September) and two in early spring (March). He thinks that this may indicate a six-month cycle of reproductive seasonality in the wild population from which the sample was derived.

Dentinal GLGs are deposited in progressively thinner units. All specimens studied deposited a GLG of nearly the same thickness in the same year of life. Myrick suggests that the rate of tooth growth is genetically determined and that the GLG thickness sequence in the sample may be used as an aid in defining and counting GLGs in specimens in which the GLG pattern is found to be similar.

Two labels were found in the captive-born specimen that apparently were introduced through its mother's milk when the then-calf was nursing. This may permit future treatments of nursing calves in ill health by treating the mother.

The manuscript, co-authored by E. W. Shallenberger and I. Kang, Sea Life Park, and D. B. MacKay, Kaneohe Veterinary Clinic, is now undergoing internal review and will be submitted to an appropriate journal in the near future.

TUNA/BILLFISH RESOURCES PROGRAM

Working Documents Prepared for the 1981 ICCAT Meeting

Working papers by Tuna/Billfish Resources Program staff members are being prepared for presentation at the meeting of the Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT) to be held November 3 to 11, 1981, in Tenerife, Canary Islands. Authors and titles of the working papers are: N. Bartoo and K. Parker ("Stochastic age-frequency estimation using the von Bertalanfy growth equations"), S. Goldberg and H. Herring-Dyal ("Histological gonad analyses of late summer-early winter collections of bigeye tuna, Thunnus obesus, and yellowfin tuna, Thunnus albacares, from the Northwest Atlantic and Gulf of Mexico"), S. Herrick ("Size and species compositions of Atlantic Tunas from imports landed in Puerto Rico during 1980"), and W. Parks, X. Bard, P. Cayre, S. Kume, and A. Santos ("Length-weight relations for bigeye tuna captured in the eastern Atlantic Ocean"). One working paper was prepared for presentation to the Subcommittee on Skipjack meeting of the SCRS: "Report of the Port Sampling Analysis Team," by A. Coan, A. Fonteneau, and M. Mensah.

Center Scientist Provides Expertise for Brazil Tuna Tagging Program

Dr. Ronald G. Rinaldo, Fishery Biologist, returned to the SWFC on October 27 after a one-month trip to Brazil in which he trained scientists from the Superintendencia do Desenvolvimento de Pesca (SUDEPE) and Empresa de Pesquisa Agropecuaria (PESAGRO-RIO) in tuna tagging techniques. The trip was at the request of the Government of Brazil and the International Commission for the Conservation of Atlantic Tunas (ICCAT) in support of the International Skipjack Year Program (ISYP). José Augusto Negrerios Aragaô, Tuna Research Leader for SUDEPE, acted as Rinaldo's host (see accompanying photograph). As a guest of SUDEPE, Rinaldo participated in two cruises on board the PESAGRO-RIO research vessel, Malacostraca. These training cruises precede the Brazilian tagging effort which is scheduled to begin in late January 1982, and continue through April. Fourteen Brazilian scientists were trained in tagging and biological sampling procedures contained in the ISYP field manuals.

Dr. Ron Rinaldo (right) and his host, José Augusto Negrerios Aragaô of SUDEPE, Brazil.

The Brazilian tuna fishery is a pole-and-line fishery that primarily catches skipjack tuna. Approximately 30 vessels with crews of 18-25 men are currently fishing within 150 miles of the states of Rio de Janeiro and Sao Paulo.

Status of Atlantic Tuna Fishery Sampling Programs

During the period January 1, 1981 to November 1, 1981, six U.S. and three foreign tuna purse seiners fishing in the Atlantic Ocean unloaded in Puerto Rico. Fifty-five size composition samples were collected for the SWFC by Inter-American Tropical Tuna Commission personnel. The sampling distribution by species is as follows:

Species	#Vessels sampled	# of samples	# of fish sampled
Yellowfin	9	21	1049
Skipjack	9	27	1352
Bigeye	4	7	211

Foreign-caught Atlantic tunas transshipped to Puerto Rico are sampled routinely for biological information by Biological Technician Eugene Holzapfel. Data on fork length, weight, and species composition of catches are collected. Results of Holzapfel's sampling during the period January 1, 1981 to November 1, 1981 are as follows:

Species	Gear	No. of samples	No. of fish sampled	Tonnage sampled (MT)
Yellowfin	Baitboat	6	344	47.15
	Purse Seine	9	572	2022.98
Skipjack	Baitboat	2	100	237.67
	Purse Seine	6	200	743.50
Bigeye	Baitboat	7	263	61.80
	Purse Seine	1	36	80.54

TIBURON LABORATORY

PINK SHRIMP MANAGEMENT PLAN

Procedure Revised to Monitor Shrimp Landings

This month Norman Abramson, Laboratory Director and a member of the Pink Shrimp Management Plan Development Team of the Pacific Fishery Management Council (PFMC), revised a procedure for sampling shrimp landings which is designed to determine whether the average size of shrimp in a boatload is less than that allowed by regulation. The PFMC and the Pacific coast states currently intend that, in lieu of a Federal plan, each state will implement identical pink shrimp management plans and regulations, based upon the PFMC's draft plan and Preferred Management Regime.

FISH COMMUNITIES INVESTIGATION

Stock Assessment of the Widow Rockfish Completed

Dr. William H. Lenarz, Leader of the Rockfish Analysis Task, reports that a stock assessment of the widow rockfish fishery has been completed for the Pacific Fishery Management Council (PFMC). Lenarz led the PFMC's Groundfish Management Team in conducting the assessment; significant contributions were also made by Dr. Robert Francis, Northwest and Alaska Fisheries Center, and M. Taggart and Dr. K. Kimura, Washington Department of Fisheries. The Team met in Portland, Oregon, on September 30 and in Seattle, Washington, on October 26 and 27 to prepare a report on the assessment and to discuss management options for the widow rockfish fishery.

Agenda Set for Western Groundfish Conference

Dr. William H. Lenarz, Rockfish Analysis Task, and Dr. Robert Francis, Northwest and Alaska Fisheries Center, set the agenda for the Western Groundfish Conference during meetings at the NWAFC on October 25. Forty-nine talks and two films are scheduled to be presented by participants from the five Pacific states. Some 75 to 100 scientists are expected to attend the meeting, which will be held at Gleneden Beach, Oregon, on November 18-20, 1981.

Shortbelly Rockfish Collected off Central California

This month members of the Predator-Prey Task aboard the NOAA vessel, David Starr Jordan, collected samples of shortbelly rockfish to determine

feeding activities and diel, seasonal, and size-depth distribution patterns of this potential market species. The sampling was conducted in previously-established study sites in the area of Ascencion and Pioneer Submarine Canyons off Central California from September 25 to October 2. Cruise participants included Fishery Biologist Tony Chess (Cruise Leader), Fishery Biologists Peter Adams and Susan Smith, and Biological Aid Daniel Howard, Tiburon Laboratory, and Paul Fisher, San Francisco State University.

Fourteen midwater trawls were made in the Ascencion Canyon area, with one 12-minute haul yielding a clean catch of 25,000 lb of shortbellies. Other shortbelly catches varied from 5 to 200 lb. Two samples each of pre-sunset and pre-sunrise fish were obtained for gut content analysis, and 22 plankton samples were collected for information on diel distribution patterns of potential prey. Efforts to obtain a satisfactory set of samples for size-depth distribution met with limited success--only one collection was obtained from five hauls in the Pioneer Canyon area.

The recent refitting of the Jordan, including installation of a SIMRAD Scientific Sounder and modification of trawl equipment design, has significantly improved the efficiency and safety of trawling operations. The new equipment functioned well throughout most of the cruise.

FISHERIES DEVELOPMENT INVESTIGATION

Euphausiid Fishing Successful

Fishery Biologists Bill Leet and Sennen Salapare this month completed two nights of euphausiid fishing over Monterey Canyon aboard the NOAA vessel, David Starr Jordan, on the third leg of cruise DS 81-09(148). The objectives of this leg were to learn seasonal distribution of euphausiids and catch rates of both euphausiids and incidental species. After adjusting the gear, three half-hour tows and one 2-hour tow were made with a midwater net. The net had an effective fishing diameter of 20 ft. A consistent catch of 400 pounds per hour was obtained on all four tows. Catches were largely free of other species of marine life.

Euphausiid samples were frozen aboard the Jordan and later processed at a freeze-drying facility in the San Francisco area. The quality of the freeze-dried product was excellent, and one dealer is seeking an immediate supply of 3-10 tons (depending on quality and price) of whole euphausiids for use as aquarium fish food; a fisherman who will fish experimentally for this dealer is now being sought. At present, commercial fishing for euphausiids is not allowed by the California Fish and Game Commission, presumably because of possible high catches of other species; however, studies being conducted by the Tiburon Laboratory personnel may convince the Commission that selective fishing is possible.

Octopus Fishing Trials Suffer Setback

Attempts by Tiburon Laboratory scientists to study octopus abundance and distribution near Santa Barbara, California, suffered a setback this month when fire destroyed the boat of a cooperating fisherman. Traps loaned to the fisherman will be transferred to another cooperator who wants to try his hand at fishing octopus.

Sea Cucumber and Whelk Fisheries are Studied

Samples of sea cucumbers have been sent to the Tiburon Laboratory for processing (boiled and dried) by a fisherman in Santa Barbara, California; a trading company in Hong Kong has requested processed samples for marketing trials. The body wall, intestines, and radial muscles of sea cucumbers are all considered delicacies by different ethnic groups, and methods of preparation differ for each body part and market destination.

A sample of whelk (Kelletia kelleti), also collected at Santa Barbara, was processed at the Tiburon Laboratory and sent to Japan. The whelks are caught incidentally in rock crab traps in shallow waters from Pt. Conception to the Mexican border. When the economics are favorable a directed fishery for whelks will be attempted, probably initially at Santa Barbara and San Diego. At present the strength of the dollar relative to the yen makes it difficult to export low-cost items to Japan.

Joint Studies on Trawling Discussed

Discussions were held this month with two cooperating fishermen regarding plans by the Tiburon Laboratory to study pair-trawling for bottom fish and beam-trawling for shrimp. The Laboratory wil provide much of the gear and the fishermen the vessels and labor for these studies, which are designed to elucidate the relative efficiency of these methods over traditional ones, especially with regard to fuel costs.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Funding Approved to Continue Striped Bass Study

Dr. Jeannette Whipple, Investigation Leader, reports that the Office of Marine Pollution Assessment has approved FY-82 funding from the Marine Sanctuaries Act, Section 202, to allow Investigation personnel to continue research on the chronic effects of pollutants on the striped bass population. This is the third year of the 5-year cooperative program (the Cooperative Striped Bass Study) between the Tiburon Laboratory and the California State Water Resources Control Board and other cooperating state agencies and institutions.

Parasite/Pollutant Interaction Studies in Progress

Dr. Mike Moser, Judy Sakanari, and Carol Reilly of the University of California, Santa Cruz, are currently investigating the effects of two pollutants (benzene and zinc) on the immune response of striped bass (Morone saxitilis). Three experiments are being run simultaneously to determine when pollutants may affect the immune response.

One group of fish was exposed to the pollutants for 2 weeks and subsequently infected with anisakid nematodes and then re-exposed to pollutants. The second group was exposed to pollutants, infected, and allowed to depurate. The third group, not exposed to pollutants, was infected with nematodes and then exposed to pollutants.

Forty-eight (48) fish were sampled on October 30, one week after the fish were infected. Dr. Tim Yoshino, an immunologist from the University of Oklahoma, will use an immunofluorescent technique to determine if the pollutants suppress the antibody response to the nematodes. Samples will be obtained 2, 3, and 4 weeks after infection.

SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

SWFC and Jordan Microcomputers are Updated

Lt. Mark Sullivan, NOAA Corps Officer assigned to ADP Operations, reports that new software versions and hardware upgrades were completed this month on several of the computer systems of the microcomputer network at the Southwest Fisheries Center and aboard the NOAA research vessel, David Starr Jordan. The newly-implemented CAMAC (Computer Automated Measurement and Control) is an IEEE (International Association of Electronic and Electrical Engineers) standard hardware design for data/instrument digitizing and collecting devices. The CAMAC aboard the Jordan uses a Digital Equipment Corporation LSI 11 microcomuter, various instrument interfaces, and a new interrupt data acquisition and communication operating system.

This new operating system uses data cassettes to communicate with both the Jordan ORION (Oceanographic Research Interactive Onboard Network) Hewlett-Packard computer and a Texas Instrument (TI) 733 ASR terminal. Data can be stored using the ORION system as well as on the TI terminal data cassettes which are compatible with terminals at the Center. Thus the data cassettes on the Texas Instruments terminal will serve as a back-up medium and/or be used when the ORION system is not onboard the Jordan. The new CAC operating system also allows the triggering of instrument data scans by internal clock, external clock. elapsed time, satellite computer rate, or manual control.

The North Star microcomputer at the Center is now designed to be a 64 K (internal memory size) machine using the CP/M (Control Processor/Microcomputer) operating system and two IBM format 5-1/4" soft sectored diskettes external memory drives. CP/M allows the use of many different types of canned software and is compatible with several other microcomputers at the Center. The North Star microcomputer and the data storage and transfer Hewlett-Packard microcomputer aboard the Jordan are now both designed to use the same format diskettes The Hewlett-Packard computer of the Jordan's ORION system stores various CAMAC data and data collected at the ORION system's remote keyboard display terminals. These diskettes and data can then be edited, processed, and transferred via phone link to other computers using the Center's North Star system.

Department of Commerce Approves Center's Computer Requests

Dorothy Roll, Systems Analyst, reports that the Department of Commerce (DoC) has approved the purchase of a remote job entry station for the Southwest Fisheries Center's Tiburon Laboratory as a replacement for their obsolete Control Data Corporation's 200 UT system. The remote station selected is a CDC 18-5M system which will access the CYBER systems at the Lawrence Berkeley Laboratory and also has the capability of communicating with other host systems using IBM 2780 and IBM 3780 protocol packages. The CDC 18-5M's configuration includes a batch terminal controller, a 300 card-per-minute

reader, a 300 line-per-minute printer, and three emulators (the 200 UT, 2780 and 3780).

The DoC has also approved requests by the SWFC's La Jolla and Honolulu Laboratories to continue computer services contracts with the University of California, San Diego, and the University of Hawaii, respectively. The contract is for the period October 1, 1981 through June 30, 1983. Because the administrative processing was not completed by September 30, the existing contract was extended through November 31, 1981, in order to avoid termination of service.

PACES Training Class Held for Fish and Game Wardens

On October 15 John Davies, SWFC Computer Specialist stationed at the Southwest Region, showed California Fish and Game wardens how to use the Pacific Area Cooperative Enforcement System (PACES) at a training class held in Los Angeles, California. Davies will conduct many training classes on the use of PACES because of the high turnover of personnel in the enforcement area. PACES can now obtain CDF&G enforcement data at 1200 baud.

Computer Inventory Systems Being Designed

Robert Butler, Computer Specialist, is currently designing, testing, and implementing two inventory systems on the UCSD's VAX computer. Through DATATRIEVE, the VAX data file manager, these systems can control computer supplies and computer equipment information. The supply inventory system contains data such as stock on hand, location of stock, order date, reorder date, and vendor. The information on the equipment inventory system includes manufacturer, model number, serial number, vendor, own or lease, purchase order number, date of procurement, expiration date for lease, purchase/lease cost, and maintenance agreement including purchase order number. These systems will provide valuable reports for the management of supply and equipment information for the La Jolla Laboratory.

Conversion of FRS to ADP Network Reviewed

On October 1 and 14, Fred Kellenberger, Data Systems Manager, and Dorothy Roll, Systems Analyst, met with Oden Burris, Computer Programmer, and Cecelia Jacobs, the EDS Contract Programmer, to review progress on converting the Financial Reporting System (FRS) from the INFONET system to ADP Network Services. The program which produces the six financial reports has been successfully compiled and verified with test data. For final validation of the converted program, Jacobs has begun the parallel testing and debugging of the report program with the actual September data set for the Honolulu Laboratory.

Technical Study Group Meets to Discuss Filing System

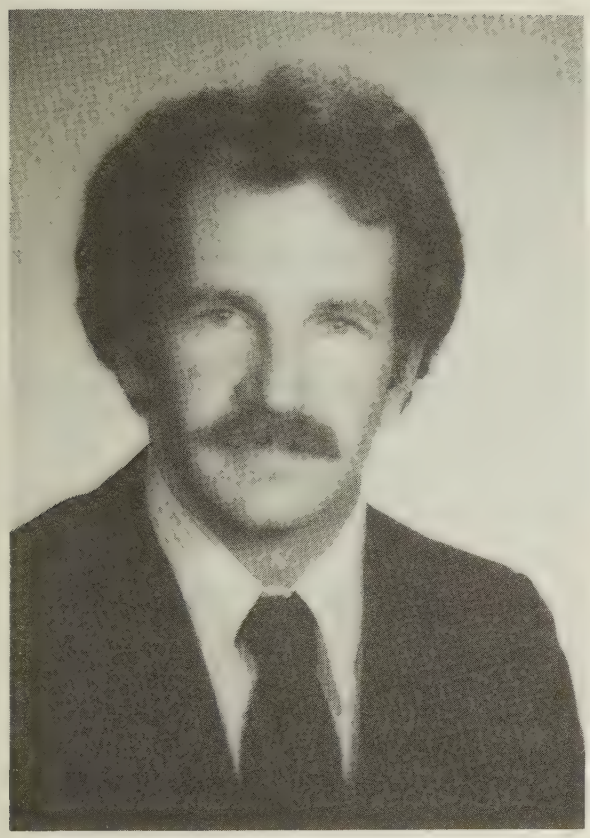
Fred Kellenberger, Data Systems Manager; Dorothy Roll, Systems Analyst; Frances Tonsich, Secretary-Stenographer; Lorraine Prescott, Editorial Assistant; Barbara Engstrand, Program Support Assistant; Julie Shoemaker, Clerk-Stenographer; and Virginia Hostler, Secretary, met October 28 to discuss implementation of the NOAA functional filing system at the Center. The participants raised questions on how to interpret the filing indices. Roll will direct these questions to the consultants at the Fisheries headquarters in Washington, D.C.; answers will be presented at the November 10 meeting.

Three Technical Users Meetings Held in October

The Staff of the ADP Operations hosted three computer technical users meetings during October. Jim Rapp, Consultant from UCSD's Computer Center, gave a presentation on MINI-TAB on October 22. During the other sessions Richard Charter, Data Manager for the Coastal Fisheries Resources Division, presented instructions on securing data files on the VAX system, and the users voiced their ideas on topics and direction for the continuing series of technical training sessions.

MISCELLANEOUS

HONORS AND AWARDS



Andrew Dizon and Lillian Vlymen Receive DoC Medals

This month Dr. Andrew Dizon, Leader of the Pelagic Ecosystem Study at the Southwest Fisheries Center's Honolulu Laboratory, and Lillian Vlymen, Technical Publications Writer/Editor at the SWFC's La Jolla Laboratory, were awarded Department of Commerce (DoC) medals. The DoC Medals are given to recognize those people who demonstrate exceptional and sustained effort toward accomplishment of the NMFS mission.

Dr. Dizon, a Fishery Biologist, received a DoC Silver Medal in a ceremony held in Washington, D.C., on October 28. He received his award "...for pioneering research in tuna physiology which has advanced fisheries science and concepts of tuna management," and also for "innovative and creative research in such areas as bioenergetics, thermal biology, hydrodynamics, navigating ability, sensory and tuna physiology as it relates to open-sea distribution and navigational orientation [which] has produced the basic and

essential knowledge for the formulation of realistic strategies to manage tuna stocks world-wide."

Mrs. Vlymen received her DoC Bronze Medal from Center Director Izadore Barrett at a reception held at the La Jolla Laboratory on October 22. Mrs. Vlymen was honored for her "...service to the public and scientific community through the clear communication of marine resources knowledge," and also for her 30 years' work as a Federal employee "...to enhance the public and professional image of Federal fisheries research by using her writing talents and organizational skills to maintain channels of communication with the general public and the scientific community."

La Jolla Laboratory

Dr. Izadore Barrett, Center Director, has been asked by the President of the University of California to serve a 3-year appointment to the Advisory Council of the Institute of Marine Resources. This will be Dr. Barrett's second appointment to the Council.

Dr. Reuben Lasker, Chief of the Coastal Fisheries Resources Division, has been appointed to the Publications Committee of the American Fisheries Society, and also to the NASA Committee on the Ocean Color Imager (OCI - formerly the Coastal Zone Color Scanner). This latter committee will be chaired by Dr. John Walsh of the Brookhaven National Laboratory.

PUBLIC AFFAIRS

La Jolla Laboratory

Laboratory Scientists Speak at Local Schools

On October 12, Fishery Biologist Dr. Al Myrick presented a talk on "Porpoise and the Yellowfin Tuna Fishery" to George Arnall's biology class at Coronado High School, Coronado, California. The talk was one of a series sponsored by the San Diego County Department of Education.

On October 23, Mathematician Dr. Nancy Lo gave a talk on "How Statistics are Applied to Fishery Research" to students at Scripps Elementary School, La Jolla, California. Dr. Lo's talk was part of the school's observance of Women's Opportunity Week, October 19-23.

34 Staff Members of the La Jolla Laboratory Donate Blood

On October 7, 34 staff members at the SWFC's La Jolla Laboratory rolled up their sleeves and donated a pint of blood to the San Diego Blood Bank. In return for their generousity, the National Marine Fisheries Service's Blood Reserve Fund will receive 23 credits for use by its employees and their

families; the remaining 11 credits will go to other funds designated by the donors.

SEMINARS

Honolulu Laboratory

October 23 - Dr. Steve Ralston, who is on an IPA assignment to the Honolulu Laboratory from the University of Washington, Seattle, Washington, spoke on "Age and growth of the opakapaka, an important food fish."

La Jolla Laboratory

October 2 - Dr. B.I. Sundarara, University of Delhi, India, presented a talk on "Hormonal regulation of vitellogenesis and maturation in catfish."

October 22 - Jacqueline Jennings, Southwest Fisheries Center, spoke on "Tracking dolphins by satellite."

Tiburon Laboratory

October 21 - Dr. Michael Rozengurt talked about "Devastation of estuaries: The present situation and future alternatives," at a joint San Francisco State University/ Tiburon Laboratory seminar held at the San Francisco State University building in Tiburon.

VISITORS

Honolulu Laboratory

October 5 - Harry Sperling, Jr., Regional Fisheries Coordinator of the Office of the Regional Representative for the South Pacific, FAO-UNDP, visited Laboratory Director Richard Shomura to discuss (1) past cruises of the Townsend Cromwell to the Western Samoa area and (2) fish aggregating devices.

October 9 - Paulo Lago, who was en route home from Japan to Brazil, was given a tour (by Robert Moffitt) of aquaculture facilities at the Hawaii Division of Aquatic Resources' Anuenue Fishery Research Center, and the Oceanic Institute.

- Dr. L.G. Eldredge of the University of Guam Marine Laboratory visited Richard Shomura.

- Dr. Roy Tsuda and Dr. Steven Amesbury of the University of Guam Marine Laboratory met with Laboratory Director Richard Shomura and Dr. Jeffrey Polovina to review plans for the scheduled Cromwell cruises to the Guam-Northern Marianas area.

October 23 - Robert E.K.D. Lee, UNDP/FAO, Bangkok, Thailand, visited Richard Shomura.

La Jolla Laboratory

October 1 - John Davies, SWFC employee stationed at Terminal Island, California, visited Fred Kellenberger at the Center.

7 - Ken Olsen, University of Tromsø, Tromsø, Norway.

- Age Kristensen, University of Trondheim, Trondheim, Norway.

9-13 - Dr. J. Moller Christensen, Director of the Danish Institute for Fisheries and Marine Research, Charlottenlund, Denmark, visited members of the Center's Coastal Fisheries Research Division.

13 - Shameem M. Mohamedi, M.A. Mohamedi & Co., Export-Import Fisheries, Karachi, Pakistan.

20 - Rick Thornbloom, California Employment Development Department, El Cajon, California.

21 - Vicky Kirby, San Diego Zoological Society, San Diego, California.

22 - Martin Conrad, German Press Agency, Bremerhaven, West Germany.

26 - Dr. Andrew Merry, Overseas Development Administration, United Kingdom, Instituto Nacional de Pesca, Guayaquil, Ecuador.

Tiburon Laboratory

October 2 - Eddie Tate, NOAA, NMFS, Seattle, Washington.

- Jules Ferris, New Zealand Marine Council and Department of Marine Affairs, Klainue Beach, Gisborne, New Zealand.

8 - Tom Cannon, Envirosphere Company, Concord, California.

- Hall Ross, DPM, MD, Project Tektite, San Francisco, California.

- Alfred L. Palmer, Sea Horizons, San Rafael, California.

MEETINGS AND TRAVEL

Honolulu Laboratory

October 1-2 - Laboratory Director Richard Shomura participated in the Scientific and Statistical Committee meeting of the Western Pacific Regional Fishery Management Council (WPRFMC) held at the Laboratory.

5-7 - Richard Shomura attended the Law of the Sea Institute's 15th annual conference at the Prince Kuhio Hotel, Honolulu.

8-9 - Richard Shomura participated in the WPRFMC meeting at the Hawaii State Capital.

13-15 - Richard Shomura attended the Marine Technology Society's International Conference on Ocean Resource Development at the East-West Center, Honolulu.

16 - Richard Shomura participated in the Hawaii Fisheries Coordinating Council meeting held at the board room of the Hawaii Department of Land and Natural Resources.

23-24 - Hazel Nishimura, Librarian, attended the "On-Line Reference Services: Database Workshop for Librarians," at the University of Hawaii Hamilton Library and the Hawaii Library Association fall conference at the Brigham Young University at Laie, Hawaii.

La Jolla Laboratory

October 1 - Dr. Izadore Barrett, Center Director, attended a San Diego-La Jolla Underwater Park Advisory meeting.

5 - Dr. Izadore Barrett, Center Director, traveled to Terminal Island, California, to meet with William Stevenson, Acting Assistant Administrator for Fisheries.

5-7 - Center Director Dr. Izadore Barrett traveled to Terminal Island, California, to participate in SES Performance Appraisal and to Los Angeles to a SSC meeting of the Pacific Fishery Management Council.

- Dr. Daniel Huppert, Dr. Wes Parks, Jim Squire, and Dr. Gary Stauffer attended the Pacific Fishery Management Council and SSC meetings in Los Angeles, California.

5-11 - Dr. R. Michael Laurs traveled to Woods Hole, Massachusetts, to participate in ICES/Symposium on Applications of Remote Sensing in Marine Research.

6 - Jacqueline Jennings traveled to Los Angeles, California, to attend the Pacific Fishery Management Council.

- Dr. Sam Herrick traveled to Los Angeles, California, to attend the Pacific Fishery Management Council's Billfish/Oceanic Shark Plan Development Team/Advisory Sub-panel meeting.

6-7 - Dr. Gary Sakagawa traveled to Terminal Island, California, to discuss dolphin-tuna actions with Southwest Region personnel and to Los Angeles to attend a meeting of the Billfish Plan Development Team.

10 - Dr. Douglas DeMaster traveled to Los Angeles to give a seminar on Marine Mammals of the Antarctic at the University of California, Los Angeles.

12 - Dr. Daniel Huppert traveled to Davis, California, to meet with the contractor on Limited Access Study to outline requirements and activities for the first stage of work.

13-16 - Dr. Sam Herrick attended the Pre-ICCAT meeting of U.S. Advisors and Commissions, in Washington, DC.

14-15 - Mark Lowry and Charles Oliver traveled to San Clemente Island, California,for continuing studies on California sea lions: Oliver continued tagging of pups and Lowry investigated the possibility of collecting scat samples for a food habits study during tagging re-sights without disturbing the rookery.

14-16 - Dr. Izadore Barrett, Center Director, and Drs. Gary Sakagawa and Sam Herrick traveled to Washington, D.C. to participate in a meeting of Advisors to the U.S. Commissioners of the International Commission for the Conservation of Atlantic Tunas (ICCAT).

18-22 - Dr. Gary Sakagawa traveled to Paris, France, to attend the 39th Meeting of the Inter-American Tropical Tuna Commission as a scientific advisor.

21 - Ben Remington participated in the final design review of the solar water heating system to be installed at the La Jolla Laboratory.

20-23 - Dr. William Perrin traveled to Seattle, Washington, to attend the Marine Mammal Commission meeting, and for consultation with the staff of the National Marine Mammal Laboratory.

Tiburon Laboratory

October 2 - Laboratory Director Norman Abramson met with Jerome Jenkins, Jenkins Pacific Shellfish Company, at Tiburon to discuss paralytic shellfish poisoning and the possibility of structuring a workshop on this subject.

3-7 - Bill Leet and Sennen Salapare were aboard the R/V Jordan to conduct exploratory fishing operations off the coast of Monterey, California.

13-16 - Susan Smith, Ted Hobson, Dan Howard, and Tony Chess traveled to Mendocino, California, to survey transects and collect fish and prey samples.

14-17 - Bruce McFarlane traveled to Newport Beach, California, to present a paper at the Western Chromatography Conference.

14-16 - Sus Kato and Bill Leet traveled to southern California to discuss cooperative experimental fishing work with fishermen in Oxnard and Santa Barbara. They also examined, in San Pedro, the trawler Oregon Beaver, which has been chartered by the Tiburon Laboratory.

21-22 - Ted Hobson, Dan Howard and Tony Chess traveled to Mendocino, California, to conduct research.

24-27 - Bill Lenarz traveled to Seattle, Washington, to attend the Groundfish Meeting and confer with R. Francis about Western Groundfish.

25-31 - Ed Ueber traveled to Seattle, Washington, to attend the Energy Conference and then went to Sublimity, Oregon, to attend the WAVE Workshop.

27-30 - Sus Kato traveled to Seattle, Washington, to attend the Fish Exposition and to confer with researchers at the Northwest and Alaska Fisheries Center and industry members.

29-31 - Norman J. Abramson traveled to Sublimity, Oregon, to attend the Workshop of Western Association for Valuation of Ecosystems.

PERSONNEL ACTIONS

Honolulu Laboratory

October 4 - Henry M. Kishinami, Biological Aid - Return to Duty.

- James H. Prescott, Biological Technician (Fisheries) Return to Duty.

- Mark A. Sheele, Computer Programmer - Part-Time, Temporary Appointment.

- Robert A. Skillman, Fishery Biologist - Promotion.

13 - Richard A. Bierma, Biological Technician (Fisheries) Full-time, Temporary Appointment.

- Alan R. Everson, Biological Technician (Fisheries) Full-time, Temporary Appointment.

- Steven H. Kramer, Biological Technician (Fisheries) Full-time, Temporary Appointment.

- Beverly C. Kuriki, Computer Clerk - Full-time, Temporary Appointment.

- Nathaniel T. Shippen, Biological Technician (Fisheries)- Full-time, Temporary Appointment.

- Edward J. Webman, Computer Technician - Part-time, Temporary Appointment.

18 - Bert S. Kikkawa, Biological Technician (Fisheries) - Change to LWOP status.

La Jolla Laboratory

October 9 - Morgan Busby, Biological Technician - Temporary Appointment.

- Nate Kostrubala, Computer Aid - Temporary Appointment.

10 - Karen Blakney, Biological Aid - Resignation.

11 - Betty Andrews, Clerk-Typist - Termination of Temporary Appointment.

13 - Helen Hills, Computer Assistant - Temporary Appointment.

- Gary Hunt, Biological Technician - Temporary Appointment.

- Lee Inness-Brown, Physical Science Technician - Temporary Appointment.

- Michael Lichter, Computer Aid - Temporary Appointment.

- Cindi Meyer, Biological Technician - Temporary Appointment.

- Philip Tarantino, Statistical Assistant - Temporary Appointment.

- Mark Zdeb, Computer Assistant - Temporary Appointment.

18 - Bill Brinkerhoff, Biological Technician - Reassignment.

19 - Oden Burris, Computer Programmer - Transfer to Naval Supply Center, San Diego, California.

Tiburon Laboratory

October 19 - Biological Aids Lisa Andrade, Patrick Guillemot, Michael King, and Steven Pace - Temporary Appointments.

- Robert Hamilton, Biological Aid - Return to Duty.

- Karen Taberski, Biological Technician - Return to Duty.

Pacific Environmental Group

October 4 - Andrew Bakun, Oceanographer - Promotion.

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